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**(54) IMPROVED EDGEWISE ORTHODONTIC BRACKET**

VERBESSERTE, HOCHKANTIGE ORTHODONTISCHE KLAMMER

BAGUE D'ORTHODONTOSIE AMELIOREE

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(73) Proprietor: **RMO, INC.**  
**Denver, Colorado 80204 (US)**

(72) Inventors:  
• **PETERSON, Jeffrey, A.**  
**Aurora, CO 80013 (US)**

• **FRANSEEN, Staven, A.**  
**Denver, CO 80235 (US)**

(74) Representative:  
**Purvis, William Michael Cameron et al**  
**D. Young & Co.,**  
**21 New Fetter Lane**  
**London EC4A 1DA (GB)**

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## Description

### FIELD OF THE INVENTION

[0001] This invention generally relates to edgewise 5  
orthodontic brackets and, more particularly, to edgewise  
brackets having enhanced treatment, comfort and ease-of-  
use features, as well as increased modalities.

### BACKGROUND OF THE INVENTION

[0002] Orthodontic brackets are widely used to align 10  
teeth through the application of forces selectively pro-  
vided by interconnected archwires and accessories.  
Brackets are typically of metal, ceramic or composite  
construction and are interconnected to either bands or 15  
bonding pads for attachment to teeth.

[0003] In edgewise brackets, an archwire passes 20  
through a labially opening, horizontal slot defined by  
one or more pair of opposing tie wings. The archwire is  
pre-shaped and sized to provide the desired forces. In  
each bracket, a tie wing pair includes a gingivally 25  
extending tie wing and occlusally extending tie wing.  
Once placed in the slot of one or more pair of tie wings,  
an archwire is typically restricted therein by a ligating  
device such as a steel or elastomeric ligature.

[0004] European Patent Specification No. 0317098 30  
discloses an edgewise orthodontic bracket as defined in  
the preamble of Claim 1.

[0005] As orthodontic treatment objectives and tech- 35  
niques continue to evolve, numerous corresponding  
edgewise bracket designs and interconnecting acces-  
sories have been proposed. Recently, it has been rec-  
ognized that it is desirable to reduce frictional  
engagement between the archwire and bracket sur-  
faces defining the archwire slot to facilitate space clo-  
sure and bodily tooth movement. Similarly, in many  
situations, it is now a goal to reduce frictional engage- 40  
ment between the archwire and ligating device  
employed to restrict the archwire within the slot. Such  
friction reduction can markedly increase the rate of  
tooth movement and reduce the duration of the ortho-  
dontic treatment.

[0006] At the same time, patient comfort and ease-of- 45  
use considerations have become increasingly impor-  
tant. Patient comfort has been largely addressed by  
reducing bracket size to yield smaller and more  
smoothly contoured bracket. Ease-of-use considera-  
tions have stimulated bracket designs which facilitate  
practitioner's bracket placement/use and accommodate 50  
plural modalities.

[0007] The present invention represents significant 55  
advances in relation to the above-noted orthodontic  
bracket considerations, both singularly and combina-  
tively, while maintaining the structural integrity of the  
bracket.

[0008] In accordance with the invention, there is pro-  
vided an edgewise orthodontic bracket comprising:

gingival and occlusal tie wings defining a labially  
opening archwire slot therebetween, each of the  
gingival and occlusal tie wings having a mesial/dis-  
tal extent, said gingival tie wing comprising a gingi-  
vally-extending center leg and gingivally-extending  
mesial and distal wing tip portions, said occlusal tie  
wing comprising an occlusally-extending center leg  
and occlusally-extending mesial and distal wing tip  
portions;

a first set of gingival and occlusal notches, the gin- 10  
gival notch being disposed within the mesial/distal  
extent of said gingival tie wing and the occlusal  
notch being disposed within the mesial/distal extent  
of said occlusal tie wing; and

a second set of gingival and occlusal notches, the 15  
gingival notch being disposed within the mesial/dis-  
tal extent of said gingival tie wing and the occlusal  
notch being disposed within the mesial/distal extent  
of said occlusal tie wing, said first set of notches  
being disposed on a mesial side of said bracket and  
said second set of notches being disposed on a dis-  
tal side of said bracket;

characterised in that said gingivally-extending 20  
center leg extends a greater distance from said  
archwire slot than each of said gingivally-extending  
mesial and distal wing tip portions, and in that said  
occlusally-extending center leg extends a greater  
distance from said archwire slot than each of said  
occlusally-extending mesial and distal wing tip por- 25  
tions.

[0009] In one aspect of the present invention, an 30  
edgewise bracket may be provided having a pair of tie  
wings defining an archwire slot therebetween, and a  
pair of ligating support means, one defined within the  
mesial/distal extent of each tie wing. The ligating sup-  
port means may be selectively employed to reduce fric-  
tional engagement between an archwire positioned in  
the slot and a ligating device positioned on the ligating 35  
support means and across the archwire slot. Each ligat-  
ing support means may include a sloped, or angled,  
portion that extends labially toward the slot (e.g., labially  
from the gingival/occlusal periphery towards the slot), to  
reduce binding of a ligating device positioned there-  
upon. The ligating support means are preferably 40  
notches extending from the gingival or occlusal periph-  
ery of a tie wing, sized to readily receive a ligating  
device, and preferably having a curvilinear, concave  
configuration to further reduce binding. Typically, the  
opposing notches in a given pair of tie wings will have a  
common center axis which is parallel to the gingival-  
occlusal center axis of the bracket. When the archwire  
slot includes convex sidewall and/or floor portions to  
reduce archwire/bracket frictional engagement, the  
ligating support means are preferably disposed adja- 45  
cent thereto (e.g., centered upon a common gingival-  
occlusal plane) for enhanced treatment control.

[0010] In another aspect of the present invention, an

edgewise bracket may be provided having a single pair of tie wings and two pairs of opposing ligating support means defined within the mesial/distal extent of the tie wings, one pair on each of the mesial and distal sides of the bracket. The gingival/occlusal extremes of the tie wings may define an elliptical configuration when viewed labially. More particularly, each tie wing may comprise central, mesial and distal portions which extend gingivally or occlusally, with ligating support means defined between the central and mesial portions and between the central and distal portions, wherein the gingival/occlusal edges of such portions define an elliptical configuration. Such configuration accommodates size reduction, yielding patient comfort benefits, while preserving structural integrity and performance.

[0011] In this regard, and as will become apparent, a single pair of opposing T-shaped tie wings is preferred. That is, the "caps" of the T-shaped tie wings define an archwire slot therebetween, and the "center legs" of each tie wing extends gingivally or occlusally. The ligating support means are preferably notches defined on the gingival/occlusal periphery on both the mesial and distal sides of a center leg of each T-shaped tie wing. The center legs may each comprise a gingivally/occlusally extending cantilevered portion that can be conveniently employed as a stanchion for ligature interconnection. The mesial/distal tie wing tip portions on the outside of each notch also may comprise gingivally/occlusally extending cantilevered portions that extend a sufficient distance outward from the outer tie wing sidewalls to retain a ligating device in an arcuate seat formed under the cantilevered tie wing tip portions and center legs during conventional ligation. Relatedly, the cantilevered center leg of each T-shaped tie wing could extend at least approximately the same distance outward beyond the outer gingival/occlusal extremes of the adjacent ligating support means so as to retain a ligating device when the ligating support notches are selectively employed by a practitioner to support a ligating device.

[0012] In a further aspect of the present invention, an edgewise bracket may be provided having a single pair of tie wings defining an archwire slot therebetween, and an integral T-shaped hook extending gingivally/occlusally from one tie wing, and in perpendicular relation to the longitudinal center axis of the archwire slot, wherein traction devices (e.g., rubber bands, springs, etc.) can be readily attached from a plurality of directions so as to accommodate plural modalities for treatment. The T-shaped hook may be centered upon the gingival/occlusal center axis of the bracket, and is preferably provided as a cantilevered extension of the center leg of a T-shaped tie wing so as to communicate external face moments created by interconnected traction devices close to a tooth's root center of resistance. Preferably, the T-shaped hook is generally flat as viewed from the mesial and distal aspects. Further, as viewed from the labial aspect, the T-shaped hook preferably comprises a

tapered portion contiguous to the center leg of the T-shaped tie wing, an arcuate neck portion contiguous thereto, and a head portion contiguous thereto the tapered portion, wherein a traction device may be reliably maintained in the neck portion. That is, the tapered portion can serve to restrict movement of the traction device towards the archwire slot of the bracket, and the head portion can serve to restrict disconnection of the traction device from the T-shaped hook. The integral T-shaped hook preferably comprises a malleable material so as to allow for selective pivotal movement of the T-shaped hook as may be desirable for soft tissue clearance and patient comfort.

[0013] In yet another aspect of the present invention, an edgewise bracket may be provided having at least one pair of tie wings defining an archwire slot therebetween, wherein when viewed from mesial/distal aspects, the gingivally/occlusally facing outer sidewalls of the tie wing pair define a trapezoid. One outer sidewall may be disposed at an angle relative to the longitudinal center plane of the archwire slot, wherein the sidewall extends labially away from such center plane. The other sidewall may be disposed substantially parallel to the archwire slot center plane. The angled sidewall may be disposed gingivally in maxillary applications and occlusally in mandibular applications. By way of example, use of the described configuration allows for enhanced, early treatment of partially erupted upper bicuspid, wherein the archwire slot will be acceptably, gingivally positioned upon full eruption of the bicuspid. This enhances treatment and reduces demands upon the practitioner time. Further, bracket systems of this design will generally reduce bracket/tooth contact between the upper and lower arches. Bracket profile and strength can also be acceptably maintained using the described configuration.

[0014] In another aspect of the present invention, an edgewise bracket may be provided having one tie wing pair defining an archwire slot therebetween and at least one auxiliary slot extending from a gingival edge to the occlusal edge, or vice versa, wherein the slot and shaft of the auxiliary device to be inserted into the slot have complimentary configurations to restrict rotational movement therebetween. By way of example, the auxiliary slot may have adjoining flat inner sidewalls (e.g., defining square corners), and the auxiliary shaft may have complimentary flat outer sidewalls (e.g., defining square corners), wherein rotational movement therebetween is desirably restricted.

[0015] In a related aspect of the present invention, an edgewise bracket may be provided having a single tie wing pair defining an archwire slot therebetween, at least one convex portion extending labially and transversely across the floor of the archwire slot, and at least one auxiliary slot extending gingivally/occlusally and positioned under the convex slot floor portion. By positioning the auxiliary slot under the convex slot floor portion, bracket height can be advantageously conserved,

and therefore reduced, so as to enhance patient comfort. When two convex slot floor portions are provided, one on each of the mesial/distal sides, twin auxiliary slots may be advantageously positioned so that one passes under each of the convex slot floor portions. In addition to the above-noted advantages, this bracket yields significant tooth rotation capabilities. For example, in early treatment stages, the twin auxiliary slots can be utilized with a steel ligature to achieve rapid gross tooth rotation. As can be appreciated, complementary auxiliary slot/auxiliary shaft configurations of the above-described nature can also be employed.

[0016] In another aspect of the present invention, an edgewise bracket may be provided having a single set of opposing T-shaped tie wings with ligating support notches defined on each side (i.e., mesially and distally) of the center leg of each tie wing. The sidewalls defining the archwire slot are preferably provided to present two sets of opposing convex sidewall portions, one set on each of the mesial and distal sides of the bracket. Similarly, the floor of the archwire slot may be provided to present two convex portions extending labially and transversely across the slot, one on each of the mesial and distal sides of the bracket. By virtue of this arrangement, the bracket yields desirable tooth rotation and alignment capabilities with reduced archwire/archwire slot frictional engagement and selectively reduced archwire/ligating device frictional engagement. Further, this configuration can define a dynamic archwire slot, wherein the archwire is allowed to maintain a "memory" of its slot entry angle, as is now desirable. The notches may each comprise a portion that extends labially outwardly from the gingival/occlusal periphery towards the archwire slot and presents concave, curvilinear surfaces to reduce ligature binding. The gingival/occlusal edges of the center legs and wing tip portions of the opposing T-shaped tie wings may define an elliptical configuration when viewed labially so as to reduce bracket size and advance patient comfort/appearance. All prominent edges exposed to soft tissue are preferably rounded for patient comfort.

[0017] An integral T-shaped hook of the above-described nature may be optionally provided as a cantilevered gingival/occlusal extension of the center leg of either T-shaped tie wing. The T-shaped hook preferably comprises a malleable material and preferably comprises flat lingually and labially facing surfaces, wherein the hook can be manually pivoted to a limited extent by a practitioner relative to the center leg of the tie wing.

[0018] An auxiliary slot may also be optionally provided and disposed within the gingival-occlusal center plane of the bracket, underlying the center leg portions of the opposing T-shaped tie wings. Alternatively, twin auxiliary slots may be provided, one on each side of the gingival-occlusal center plane of the bracket (i.e., mesially and distally positioned), such slots passing under the mesial and the distal convex slot floor portions of the archwire slot. Whether a single or twin aux-

iliary slot arrangement is provided, each slot preferably has an inner-configuration which will restrict rotation of complimentary auxiliaries inserted thereto, as described above.

[0019] The T-shaped tie wings of the bracket may also be optionally defined so that the outer gingival/occlusal facing sidewalls of the tie wing pair define a trapezoid when viewed from the mesial or distal aspects. More particularly, one of the outer sidewalls is disposed at an angle relative to the longitudinal center plane of the archwire slot, and is perpendicular to the tie wing base surface or base/bottom surface of the bracket. The other outer sidewall is disposed in parallel relation to the center plane of the archwire slot.

[0020] The center leg of each T-shaped tie wing may also be optionally disposed at an acute angle relative to the longitudinal center axis of the slot. Such angling may be desired in applications wherein the central axis of the clinical crown is positioned at an acute angle relative to the occlusal plane in normal occlusion. Such angling correspondingly facilitates the practitioner's placement of the bracket on a tooth, wherein the axes of the center legs may be disposed along a tooth long axis, and wherein the center axis of the bracket slot may be disposed parallel to the occlusal plane. Preferably, the mesial/distal facing edges of the center leg of each T-shaped tie wing are also parallel to the axes of the center legs to further facilitate accurate placement on a tooth. It is also preferable for the center axes of opposing ligating support notches to be disposed parallel to the gingival-occlusal center plane of the bracket. Relatedly, for rotational purposes, it is preferable for the apices of the opposing convex slot sidewall portions and a convex slot floor portion correspondingly positioned on the same mesial or distal side to lie within a common plane that is disposed substantially perpendicular to the longitudinal center plane of the archwire slot.

[0021] As will be appreciated by those skilled in the art, the embodiment of the invention described herein yields numerous advantageous features, yielding a new state-of-the-art bracket.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0022]

Figs. 1A-C illustrate labial, side and end views of one embodiment of the present invention;

Figs. 2A and 2B, and Figs. 2C and 2D, illustrate labial and end views of the embodiment of Figs. 1A-C when ligating support means are employed to support an elastomeric ligature and when ligating support means are not employed to support an elastomeric ligature, respectively;

Figs. 3A-C illustrate labial, side and end views of a modified version of said embodiment of the present invention having an integral T-shaped hook and twin auxiliary slots;

Figs. 4A-C illustrate labial, side and end views of a modified version of said embodiment of the present invention having outer tie wing sidewalls that define a trapezoid therebetween;

Figs. 5A-D illustrate labial, side and end views of the modified embodiment of the present invention illustrated in Figs. 4A-C, with a central auxiliary slot; Figs. 6A-C illustrate labial, side and opposing end views of the modified embodiment of the present invention illustrated in Figs. 4A-C, with an angulated gingival-occlusal center axis and twin auxiliary slots; and,

Figs. 7A-B illustrate two views of an exemplary auxiliary device useable with the auxiliary slots of the present invention.

#### DETAILED DESCRIPTION

[0023] One embodiment of the edgewise bracket 10 of the present invention is illustrated in Figs. 1A-C and 2A-D, with various modifications, modalities and an exemplary auxiliary reflected by Figs. 3A-C, 4A-C, 5A-C, 6A-C and 7A-B. Corresponding features are referenced by common reference numerals.

[0024] The edgewise bracket 10 comprises two integral, opposing T-shaped tie wings 12 and 14 having a common base portion and base surface 16, and defining an archwire slot 18 therebetween. By way of example only, a flange 32 may be adjoined to the bracket 10 for subsequent attachment to a band. Alternatively, the bracket may be adjoined to a bonding pad (not shown).

[0025] Two sets of opposing ligating support means 20 and 22, are provided, each set comprising a gingivally disposed notch and occlusally disposed notch on the gingival and occlusal edges of tie wings 12, 14, respectively. Each ligating support means has a sloped portion 24 and top land portion 26. The sloped portions 24 have concave, curvilinear surfaces.

[0026] Each of the T-shaped tie wings 12, 14 comprises a cantilevered central leg portion 28 centered upon the gingival-occlusal center axis (lying within plane AA) of the bracket 10 and cantilevered mesial/distal wing tip portions 30, with the above-noted top land portions 26 integral therebetween. The gingival/occlusal extremes of the center leg 28 and mesial/distal wing tip portions 30 of the tie wings 12, 14 define, from the labial aspect, an elliptical configuration E. In this regard, cantilevered wing tip portions 30 extend a sufficient distance d outward from the outer sidewalls 34, 36 of the tie wings 12, 14, respectively, to retain a ligating device in an arcuate seat 38 formed under the cantilevered tie wing tip portions 30 and center legs 28. Relatedly, the cantilevered center leg 28 of each T-shaped tie wing 12, 14, extends a distance f beyond the outer gingival/occlusal extreme of the ligating support means 20 adjacent thereto, such distance f being at least approximately as great as the distance d.

[0027] The sidewalls defining the archwire slot 18

comprise two sets of opposing convex portions 42 to reduce frictional engagement with an archwire. Similarly, the floor of archwire slot 18 is provided with two convex portions 44 extending transversely across the archwire slot 18 to reduce frictional engagement with an archwire. As illustrated in Figs. 1A-C, the ligating support means 20, convex slot sidewall portions 42, and convex slot floor portion 44 disposed on the same side of the gingival-occlusal center plane AA may have a common center axis (lying within plane BB). As such, frictional engagement between an archwire and the slot walls and base, and between an archwire and ligating device supported on ligating support means 20 occurs in a limited region about plane BB.

[0028] An optional auxiliary slot 70 may be provided to receive a complimentary auxiliary device, such as the exemplary auxiliary 74 illustrated in Figs. 7A and 7B. The inner sidewalls of auxiliary slot 70 and interfacing shaft portion 76 of the exemplary auxiliary 74 are preferably configured to restrict rotational movement therebetween. As illustrated, a complimentary square-angled configuration may be employed. Additionally, the auxiliary 74 preferably comprises an extending portion 78 having an outer configuration which will not fit into auxiliary slot 70, thereby facilitating placement and removal.

[0029] Figs. 2A-B illustrate the interface between an archwire X and elastomeric ligating device Y when both sets of the ligating support means 20 of the embodiment of the present invention illustrated in Figs. 1A-C are utilized. Figs. 2C-D illustrate the interface between an archwire X and elastomeric ligating device Y when neither of the ligating support means 20 of such embodiment are utilized. As will be appreciated by those in the art, there are different treatment situations where each of these modalities may be desired. Additionally, the provision of a set of ligating support means 20 on each of the mesial and distal sides of the bracket 10 allows a practitioner to utilize one set but not the other, as may be desirable.

[0030] In Figs. 3A-C an integral T-shaped hook 50 is provided as an extension to the center leg 28 of one of the T-shaped tie wings 12. The T-shaped hook 50 preferably comprises flat lingual and labial surfaces (see Fig. 3C), and is preferably malleable to allow for pivotal movement relative to center leg 20. The T-shaped hook 50 preferably comprises a tapered portion 52, arcuate neck portion 54 and head portion 56, whereby retention of a traction device in neck portion 54 is enhanced.

[0031] Twin auxiliary slots 80 may be optionally provided for receipt of an auxiliary device, such as the exemplary auxiliary 74 shown in Figs. 7A-B. The twin auxiliary slots 80 are beneficially disposed under the convex slot floor portions 44. The configuration of slots 80 and exemplary auxiliary 74 may be as described above to restrict rotational movement therebetween and facilitate placement/removal.

[0032] Figs. 3A-C also illustrate optional saddles 60 which can be provided in the support landing portions

26 for receiving a ligating device. It is believed that such saddles 60 may be beneficial in certain early treatment situations for purposes of retaining an undersized archwire in the desired position for rotational purposes.

[0033] In Figs. 4A-D, the outer sidewall 34 of tie wing 12 and outer sidewall 36 of tie wing 14 define a trapezoid therebetween. Specifically outer side wall 34 is angled relative to the longitudinal center plane CC of the archwire slot 18, and the outer tie wing sidewall 36 is disposed in parallel relation to the center plane CC of the archwire slot 18. By virtue of this arrangement, the outer sidewall 34 may be, for example, advantageously disposed gingivally on partially erupted upper bicuspids. Further, bracket systems employed by this configuration will generally reduce bracket/tooth contact between upper and lower arches.

[0034] The modified embodiment illustrated in Figs. 4A-C is shown with additional features in Figs. 5A-C and 6A-C. In Figs. 5A-C, a central auxiliary slot 70 is provided. Figs 6A-C illustrate the inclusion of twin auxiliary slots 80 for receiving of auxiliary devices. The twin vertical slots 80 are disposed so that each passes under one of the convex slot floor portions 44.

[0035] In the version shown in Figs. 6A-C, it should also be appreciated that the gingival-occlusal center axis of the bracket (lying within plane AA) can be disposed at an acute angle relative to center axis of archwire slot 18 (lying within plane CC). More particularly, center legs 28 may be centered upon the gingival-occlusal center axis and may be provided with distal/mesial surfaces 84 which are parallel to the gingival-occlusal center axis thereby facilitating placement of the bracket. In this modified version, it should be recognized that while the center plane BB of the ligating support means 20 is also disposed parallel to the gingival-occlusal center axis, the apices of the convex slot sidewall portions 42 and convex slot floor portion on each of mesial and distal sides lie in a plane which is perpendicular to the archwire slot center plane CC. Relatedly, it should be appreciated that, when a T-shaped hook is utilized (such as the T-shaped hook 50 illustrated in Figs. 3A-C above), the center axis thereof will be disposed perpendicularly to the center axis of the archwire slot 18 and at an angle relative to the gingival-occlusal center axis of the bracket 10.

[0036] An auxiliary slot (not shown) may be provided that extends entirely through the bracket from the occlusal sidewall (36) to the gingival sidewall (34).

[0037] The foregoing description of the present invention has been provided for purposes of illustration and description. This description is not intended to limit the invention and various modalities thereof. Variations, embodiments and modifications will be apparent to those skilled in the art and are intended to be within the scope of the following claims.

## Claims

### 1. An edgewise orthodontic bracket (10) comprising:

gingival and occlusal tie Wings (12, 14) defining a labially opening archwire slot (18) therebetween, each of the gingival and occlusal tie wings having a mesial/distal extent, said gingival tie Wing (12) comprising a gingivally-extending center leg (28) and gingivally-extending mesial and distal wing tip portions (30), said occlusal tie wing (14) comprising an occlusally-extending center leg (28) and occlusally-extending mesial and distal wing tip portions (30);

a first set of gingival and occlusal notches (20), the gingival notch being disposed within the mesial/distal extent of said gingival tie wing (12) and the occlusal notch being disposed within the mesial/distal extent of said occlusal tie wing (14); and

a second set of gingival and occlusal notches (22), the gingival notch being disposed within the mesial/distal extent of said gingival tie wing (12) and the occlusal notch being disposed within the mesial/distal extent of said occlusal tie wing (14), said first set of notches being disposed on a mesial side of said bracket and said second set of notches being disposed on a distal side of said bracket;

characterised in that said gingivally-extending center leg (28) extends a greater distance (F) from said archwire slot (18) than each of said gingivally-extending mesial and distal wing tip portions (30), and in that said occlusally-extending center leg (28) extends a greater distance (F) from said archwire slot (18) than each of said occlusally-extending mesial and distal wing tip portions (30).

### 2. A bracket according to Claim 1, wherein:

gingival edges of said gingival tie wing and occlusal edges of said occlusal tie wing define an elliptical configuration (E).

### 3. A bracket according to Claim 1 or Claim 2, comprising:

a first set of opposing convex sidewall portions (42) and a first convex floor portion (44) within said archwire slot (18), wherein said first set of convex sidewall portions and said first convex floor portion are positioned substantially between said gingival and occlusal notches of said first set of notches (20); and, a second set of opposing convex sidewall portions (42) and a second convex floor portion

(44) within said archwire slot (18), wherein said second set of convex sidewall portions and said second convex floor portion are positioned substantially between said gingival and occlusal notches of said second set of notches (22).

4. A bracket according to any of Claims 1 to 3, comprising:

a cantilevered, T-shaped hook (50) extending from and integral with the center leg portion (28) of one of said gingival and occlusal tie wings (12, 14).

5. A bracket according to Claim 4, wherein said T-shaped hook comprises:

a tapered portion (52) contiguous with said center leg portion (28) of said one of said gingival and occlusal tie wings (12, 14);  
a neck portion (54) contiguous with said tapered portion (52); and  
a head portion (56) contiguous with said neck portion (54).

6. A bracket according to any preceding Claim, wherein said gingival tie wing (12) has an outer sidewall (34) extending labially away from a longitudinal center plane (c-c) of said archwire slot (18), said occlusal tie wing (14) having an outer sidewall (36) extending substantially parallel to said longitudinal center plane (c-c) of the archwire slot (18), wherein a trapezoidal configuration is defined between said outer sidewalls.

7. A bracket according to any of Claims 1 to 5, wherein said gingival tie wing (14) has an outer sidewall (34) extending labially away from a longitudinal center plane (c-c) of said archwire slot (18), said occlusal tie wing (12) having an outer sidewall (36) extending substantially parallel to said longitudinal center plane (c-c) of the archwire slot (18), wherein a trapezoidal configuration is defined between said outer sidewalls.

8. A bracket according to any preceding Claim, wherein said archwire slot (18) has opposing sidewalls and an adjoining floor; said bracket comprising:

a first auxiliary slot (70; 80) positioned under said floor.

9. A bracket according to Claim 8, comprising:

a second auxiliary slot (80) positioned under said floor;  
wherein said first auxiliary slot (80) is located

on a mesial side of said bracket, and said second auxiliary slot (80) is located on a distal side of said bracket (10).

10. A bracket according to any of Claims 6 to 9, comprising:

an auxiliary slot extending entirely through the bracket from said occlusal sidewall (36) to said gingival sidewall (34).

11. An edgewise orthodontic bracket according to any of Claims 8 to 10, wherein said auxiliary slot (70; 80) comprises adjoining, flat sidewalls.

12. Combination of a bracket according to any of Claims 8 to 11 and an auxiliary orthodontic treatment device (74) comprising a shaft portion (76) positionable within said auxiliary slot; said auxiliary slot (70; 80) and said shaft portion (76) of said auxiliary orthodontic treatment device having complementary configurations wherein rotational movement therebetween is restricted.

13. A combination according to Claim 12, wherein said shaft portion (76) of said auxiliary device (74) comprises adjoining, flat outer sidewalls capable of complementary engagement with the auxiliary slot.

14. A bracket according to any preceding Claim, comprising:

a base (32) attachable to a tooth, said gingival and occlusal tie wings extending upwardly from said base.

15. A bracket according to any preceding Claim, wherein each of said notches (20, 22) is adapted for receiving a device (Y) for retaining an archwire (X) in the archwire slot (18) and wherein each of said notches (20, 22) slopes upwardly from their periphery through at least a portion of one of said tie wings toward said slot (18), and has laterally displaced sidewall portions and a bottom portion which define a substantially arcuate surface (24), and wherein undesired frictional contact between the archwire (X) and said device for retaining (Y) may be selectively reduced.

16. A bracket according to Claim 15, wherein the archwire slot (18) has a depth that is greater than the height of the archwire (X) when positioned in the slot (18).

17. A bracket according to Claim 15 or Claim 16, wherein said device for retaining (Y) comprises a metallic ligature wire.



18. A bracket according to Claim 17, wherein said notches (20, 22) further have a mesiodistal width slightly greater than a thickness of said wire.
19. A bracket according to Claim 15 or Claim 16, wherein said device for retaining (Y) comprises an elastomeric ligature.
20. A bracket according to Claim 19, wherein said notches (20, 22) have a mesiodistal width slightly less than a thickness of said elastomeric ligature.
21. A bracket according to any preceding Claim, wherein said notches (20, 22) have a generally concave shape.
22. A bracket according to any preceding Claim, wherein said notches comprise: a surface sloping upwardly from the periphery thereof toward the archwire slot (18) and through at least a portion of tie wings; and a support landing proximate the slot (18).
23. A bracket according to any preceding Claim, wherein said notches split wing tips on each of said tie wings into a mesial tip and a distal tip, wherein one of said mesial or distal tips has an occlusal-gingival length greater than another of said mesial or distal tips.

#### Patentansprüche

1. Hochkantige orthodontische Klammer (10), welche aufweist:
- gingivale und okklusale Bänderflügel (12, 14), welche dazwischen einen labialen Bogendrahtöffnungschlitz (18) definieren, wobei jeder der gingivalen und okkusalen Bänderflügel eine mesiale/distale Ausdehnung hat, wobei der gingivale Bänderflügel (12) einen sich gingival erstreckenden Zentrumsfuß (28) und einen sich gingival erstreckenden mesial und distalen Flügelspitzenabschnitt (30) aufweist, und wobei der okklusale Bänderflügel (14) einen sich okkusal erstreckenden Zentrumsfuß (28) und sich okkusal erstreckende mesiale und distale Flügelspitzenabschnitte (30) aufweist;
- einen ersten Satz von gingivalen und okkusalen Kerben (20), wobei die gingivale Kerbe innerhalb der mesialen/distalen Ausdehnung des gingivalen Bänderflügels (12) angeordnet ist und wobei die okklusale Kerbe innerhalb der mesialen/distalen Ausdehnung des okkusalen Bänderflügels (14) angeordnet ist; und
- einen zweiten Satz von gingivale und okkusa-

len Kerben (22), wobei die gingivale Kerbe innerhalb der mesialen/distalen Ausdehnung des gingivalen Bänderflügels (12) angeordnet ist und wobei die okklusale Kerbe innerhalb der mesialen/distalen Ausdehnung des okkusalen Bänderflügels (14) angeordnet ist, wobei der erste Satz der Kerben an einer mesialen Seite der Klammer angeordnet ist und wobei der zweite Satz der Kerben an einer distalen Seite der Klammer angeordnet ist; dadurch gekennzeichnet, daß sich der sich gingival erstreckende Zentrumsfuß (28) über eine größere Entfernung (F) von dem Bogendrahtschlitz (18) erstreckt, als jeder der sich gingival erstreckenden mesialen und distalen Flügelspitzenabschnitten (30), und daß sich der sich okkusal erstreckende Zentrumsfuß (28) über eine größere Entfernung (F) von dem Bogendrahtschlitz (18) erstreckt, als jeder der sich okkusal erstreckenden mesialen und distalen Flügelspitzenabschnitte (30).

#### 2. Klammer nach Anspruch 1, wobei:

gingivale Kanten des gingivalen Bänderflügels und okklusale Kanten des okkusalen Bänderflügels eine elliptische Konfiguration (E) bestimmen.

#### 3. Klammer nach Anspruch 1 oder 2, welche aufweist:

einen ersten Satz von sich gegenüberliegenden konvexen Seitenwandabschnitten (42) und einen ersten konvexen Bodenabschnitt (44) innerhalb des Bogendrahtschlitzes (18), wobei der erste Satz der konvexen Seitenwandabschnitte und der erste konvexe Bodenabschnitt im wesentlichen zwischen den gingivalen und okkusalen Kerben des ersten Satzes von Kerben (20) angeordnet ist; und

einen zweiten Satz von sich gegenüberliegenden konvexen Seitenabschnitten (42) und einem zweiten konvexen Bodenabschnitt (44) innerhalb des Bogendrahtschlitzes (18), wobei der zweite Satz der konvexen Seitenwandabschnitte und der zweite konvexe Bodenabschnitt im wesentlichen zwischen den gingivalen und okkusalen Kerben des zweiten Satzes von Kerben (22) angeordnet ist.

#### 4. Klammer nach einem der Ansprüche 1 bis 3, welcher aufweist:

einen auskragenden T-förmigen Haken (50) welcher sich von und einstückig mit dem Zentrumsfußabschnitt (28) von einem der gingivalen und okkusalen Bänderflügel (12, 14)

erstreckt.

5. Klammer nach Anspruch 4, wobei der T-förmige Haken aufweist:

einen konischen Abschnitt (52), welcher an dem Zentrumsfußabschnitt (28) von einem der gingivalen und okkusalen Bänderflügel (12, 14) angrenzt;

einen Nackenabschnitt (54), welcher an den konischen Abschnitt (52) angrenzt; und

einen Kopfabschnitt (56), welcher an den Nackenabschnitt (54) angrenzt.

6. Klammer nach einem der vorhergehenden Ansprüche, wobei der gingivale Bänderflügel (12) eine äußere Seitenwand (34) aufweist, welche sich labial von einer Längszentrumsebene (c-c) des Bogendrahtschlitzes (18) weg erstreckt, wobei der okkussale Bänderflügel (14) eine äußere Seitenwand (36) aufweist, welche sich im wesentlichen parallel zur Längszentrumsebene (c-c) des Bogendrahtschlitzes (18) erstreckt, wobei eine Trapezkonfiguration zwischen den äußeren Seitenwänden begrenzt ist.

7. Klammer nach einem der vorhergehenden Ansprüche 1 bis 5, wobei der gingivale Bänderflügel (14) eine äußere Seitenwand (34) aufweist, welche sich labial von einer Längszentrumsebene (c-c) des Bogendrahtschlitzes (18) weg erstreckt, wobei der okkussale Bänderflügel (12) eine äußere Seitenwand (36) aufweist, welche sich im wesentlichen parallel zur Längszentrumsebene (c-c) des Bogendrahtschlitzes (18) erstreckt, wobei eine Trapezkonfiguration zwischen den äußeren Seitenwänden begrenzt ist.

8. Klammer nach einem der vorhergehenden Ansprüche, wobei der Bogendrahtschlitz (18) sich gegenüberliegende Seitenwände und einen angrenzenden Boden aufweist; wobei die Klammer aufweist: einen ersten Hilfsschlitz (70; 80), welcher unter dem Boden positioniert ist.

9. Klammer nach Anspruch 8, welche aufweist:

einen zweiten Hilfsschlitz (80), welcher unterhalb des Bodens positioniert ist; wobei sich der erste Hilfsschlitz (80) an einer mesialen Seite der Klammer befindet, und wobei sich der zweite Hilfsschlitz (80) an einer distalen Seite der Klammer (10) befindet.

10. Klammer nach einem der Ansprüche 6 bis 9, welche aufweist:

einen Hilfsschlitz, welcher sich vollständig durch die Klammer von der okkusalen Seitenwand (36) zur gingivalen Seitenwand (34) erstreckt.

11. Hochkantige orthodontische Klammer nach einem der Ansprüche 8 bis 10, wobei der Hilfsschlitz (70; 80) angrenzende flache Seitenwände aufweist.

12. Kombination einer Klammer gemäß einem der Ansprüche 8 bis 11 und einer hilfsothodontischen Behandlungsvorrichtung (74), welche einen Schaftabschnitt (76) aufweist, welcher innerhalb des Hilfsschlitzes positionierbar ist, wobei der Hilfsschlitz (70, 80) und der Schaftabschnitt (76) der hilfsothodontischen Behandlungsvorrichtung komplementäre Konfigurationen aufweisen, wobei zwischen diesen eine Drehbewegung eingeschränkt ist.

13. Kombination nach Anspruch 12, wobei der Schaftabschnitt (76) der Hilfsvorrichtung (74) der angrenzende flache äußere Seitenwände aufweist, welche fähig sind, daß sie mit dem Hilfsschlitz komplementär in Eingriff sind.

14. Klammer nach einem der vorhergehenden Ansprüche, welche aufweist:

eine Basis (32), welche an einen Zahn anbringbar ist, wobei sich die gingivalen und okkusalen Bänderflügel nach oben von der Basis erstrecken.

15. Klammer nach einem der vorhergehenden Ansprüche, wobei jede Kerbe (20, 22) zur Aufnahme einer Vorrichtung (Y) zum Halten eines Bogendrahtes (X) in dem Bogendrahtschlitz (18) fähig ist, und wobei sich jede Kerbe (20, 22) nach oben von deren Umfang durch zumindest einen Abschnitt von einem der Bänderflügel zum Schlitz (18) neigt, und seitlich versetzte Seitenwandabschnitte und einen Grundabschnitt aufweist, welche eine im wesentlichen bogenförmige Oberfläche (24) bestimmen, und wobei unerwünschter Reibungskontakt zwischen dem Bogendraht (X) und der Halterungsvorrichtung (Y) wahlweise reduziert werden kann.

16. Klammer nach Anspruch (15), wobei der Bogendrahtschlitz (18) eine Tiefe aufweist, die größer ist als die Höhe des Bogendrahtes (X), wenn er sich in dem Schlitz (18) befindet.

17. Klammer nach Anspruch (15) oder (16), wobei die Halterungsvorrichtung (Y) einen Metallbanddraht aufweist.

18. Klammer nach Anspruch (17), wobei die Kerben (20, 22) ferner eine mesiodistale Breite aufweisen,

welche etwas größer als die Dicke des Drahtes ist.

19. Klammer nach Anspruch (15) oder (16), wobei die Halterungsvorrichtung (Y) ein elastomeres Band aufweist. 5
20. Klammer nach Anspruch (19), wobei die Kerben (20, 22) eine mesiodistale Breite aufweisen, welche etwas geringer ist als die Dicke des elastomeren Bandes. 10
21. Klammer nach einem der vorhergehenden Ansprüche, wobei die Kerben (20, 22) eine im allgemeinen konkave Form aufweisen. 15
22. Klammer nach einem der vorhergehenden Ansprüche, wobei die Kerben aufweisen:
- eine Oberfläche, welche sich nach oben von dessen Umfang zum Bogendrahtschlitz (18) und durch zumindest einen Abschnitt der Bänderflügel neigt; und eine Stütze, welche unmittelbar an den Schlitz (18) angrenzt. 20
23. Klammer nach einem der vorhergehenden Ansprüche, wobei die Kerben die Flügelspitzen von jedem der Bänderflügel in eine mesiale Spitze und eine distale Spitze spalten, wobei eine der mesialen oder distalen Spitzen eine okklusalingivale Länge aufweist, die größer ist als eine andere der mesial oder distalen Spitzen. 30

#### Revendications

1. Support latéral d'orthodontie (10) comprenant : 35
- des ailettes de tirage gingivale et occlusale (12, 14) qui délimitent une fente (18) de fil de liaison débouchant labialement entre elles, chacune des ailettes de tirage gingivale et occlusale ayant une étendue médiale-distale, l'ailette gingivale de tirage (12) comprenant une branche centrale (28) du côté gingival et des parties (30) de bout d'ailette médiale et distale du côté gingival, l'ailette occlusale de tirage (14) comprenant une branche centrale (28) s'étendant du côté occlusal et des parties (30) de bout d'ailette médiale et distale tournées du côté occlusal, 40
- un premier ensemble d'encoches (20) gingivale et occlusale, l'encoche gingivale étant placée suivant l'étendue médiale-distale de l'ailette gingivale de tirage (12) et l'encoche occlusale étant disposée dans l'étendue médiale-distale de l'ailette occlusale de tirage (14), et 50
- un second ensemble d'encoches gingivale et occlusale (22), l'encoche gingivale étant dispo-

sée dans l'étendue médiale-distale de l'ailette gingivale de tirage (12) et l'encoche occlusale étant disposée dans l'étendue médiale-distale de l'ailette occlusale de tirage (14), le premier ensemble d'encoches étant disposé d'un côté médial du support et le second ensemble d'encoches étant disposé d'un côté distal du support, 5

caractérisé en ce que la branche centrale (28) s'étend par rapport à la lente (18) pour fil de liaison à une plus grande distance (F) que chacune des parties (30) de bout d'ailette médiale et distale s'étendant du côté gingival, et en ce que la branche centrale (28) s'étendant du côté occlusal s'étend depuis la lente (18) du fil de liaison sur une plus grande distance (F) que chacune des parties (30) de bout d'ailette médiale et distale tournées du côté occlusal. 10

2. Support selon la revendication 1, dans lequel les bords gingivaux de l'ailette gingivale de tirage et les bords occlusaux de l'ailette occlusale de tirage délimitent une configuration elliptique (E). 15
3. Support selon la revendication 1 ou 2, comprenant :
- un premier ensemble de parties convexes opposées de paroi latérale (42) et une première partie convexe de fond (44) dans la fente (18) du fil de liaison, le premier ensemble de parties convexes de paroi latérale et de la première partie convexe de fond étant disposé pratiquement entre les encoches gingivale et occlusale du premier ensemble d'encoches (20), et 20
- un second ensemble de parties convexes opposées de paroi latérale (42) et une seconde partie convexe de fond (44) dans la fente (18) du fil de liaison, le second ensemble de parties convexes de paroi latérale et de la seconde partie convexe de fond étant disposé pratiquement entre les encoches gingivale et occlusale du second ensemble d'encoches (22). 25
4. Support selon l'une quelconque des revendications 1 à 3, comprenant un crochet en T en porte-à-faux (50) qui s'étend depuis la partie de branche centrale (28) de l'une des ailettes gingivale et occlusale de tirage (12, 14) et est solidaire de cette partie de branche. 30
5. Support selon la revendication 4, dans lequel le crochet en T comprend :
- une partie effilée (52) contiguë à la partie de branche centrale (28) de la première des ailettes gingivale et occlusale de tirage (12, 14), 35
- une partie de col (54) contiguë à la partie effi-

lée (52), et  
une partie de tête (56) contiguë à la partie de  
col (54).

6. Support selon l'une quelconque des revendications précédentes, dans lequel l'ailette gingivale de tirage (12) a une paroi latérale externe (34) qui s'étend du côté labial en s'écartant du plan longitudinal central (C-C) de la fente (18) du fil de liaison, l'ailette occlusale de tirage (14) ayant une paroi latérale externe (36) qui s'étend pratiquement en direction parallèle au plan longitudinal central (C-C) de la fente (18) du fil de liaison, et une configuration trapézoïdale est délimitée entre les parois latérales externes.
7. Support selon l'une quelconque des revendications 1 à 5, dans lequel l'ailette gingivale de tirage (14) a une paroi latérale externe (34) qui s'étend du côté labial en s'écartant d'un plan longitudinal central (C-C) de la fente (18) du fil de liaison, l'ailette occlusale (12) de tirage ayant une paroi latérale externe (36) qui s'étend pratiquement en direction parallèle au plan longitudinal central (C-C) de la fente (18) du fil de liaison, une configuration trapézoïdale étant délimitée entre les parois latérales externes.
8. Support selon l'une quelconque des revendications précédentes dans lequel la fente (18) du fil de liaison a des parois latérales opposées et un fond adjacent, le support comprenant une première fente auxiliaire (70 ; 80) placée sous le fond.
9. Support selon la revendication 8, comprenant :  
une seconde fente auxiliaire (80) placée sous le fond,  
dans lequel la première fente auxiliaire (80) est placée du côté médial du support et la seconde fente auxiliaire (80) est placée du côté distal du support (10).
10. Support selon l'une quelconque des revendications 6 à 9, comprenant une fente auxiliaire qui s'étend entièrement dans le support depuis la paroi latérale occlusale (36) vers la paroi latérale gingivale (34).
11. Support latéral d'orthodontie selon l'une quelconque des revendications 8 à 10, dans lequel la fente auxiliaire (70 ; 80) comporte des parois latérales plates adjacentes.
12. Combinaison d'un support selon l'une quelconque des revendications 8 à 11 et d'un dispositif auxiliaire (74) de traitement d'orthodontie, comprenant une partie de tige (76) destinée à être placée dans la fente auxiliaire, la fente auxiliaire (70 ; 80) et la partie de tige (76) du dispositif auxiliaire de traite-

ment d'orthodontie ayant des configurations complémentaires si bien qu'un mouvement mutuel de rotation est limité.

13. Combinaison selon la revendication 12, dans laquelle la partie de tige (76) du dispositif auxiliaire (74) comprend des parois latérales externes plates adjacentes capables de coopérer de façon complémentaire avec la fente auxiliaire.
14. Support selon l'une quelconque des revendications précédentes, comprenant une base (32) qui peut être fixée à une dent, les ailettes gingivale et occlusale de tirage s'étendant au-dessus de la base.
15. Support selon l'une quelconque des revendications précédentes, dans laquelle chacune des encoches (20, 22) est destinée à loger un dispositif (Y) de retenue d'un fil de liaison (X) dans la fente (18) de fil de liaison, et dans lequel chacune des encoches (20, 22) est inclinée vers le haut depuis la périphérie dans au moins une partie de l'une des ailettes de tirage vers la fente (18) et possède des parties de paroi latérale décalées latéralement et une partie de fond qui délimitent une surface pratiquement courbe (24), et dans lequel un contact indésirable par friction entre le fil de liaison (X) et le dispositif de retenue (Y) peut être réduit sélectivement.
16. Support selon la revendication 15, dans lequel la fente (18) du fil de liaison a une profondeur supérieure à la hauteur du fil de liaison (X) lorsqu'il est placé dans la fente (18).
17. Support selon la revendication 15 ou 16, dans lequel le dispositif de retenue (Y) comprend un fil métallique de ligature.
18. Support selon la revendication 17, dans lequel les encoches (20, 22) ont en outre une largeur médi-distale légèrement supérieure à l'épaisseur du fil.
19. Support selon la revendication 15 ou 16, dans lequel le dispositif de retenue (Y) est une ligature élastomère.
20. Support selon la revendication 19, dans lequel les encoches (20, 22) ont une largeur médi-distale légèrement inférieure à l'épaisseur de la ligature élastomère.
21. Support selon l'une quelconque des revendications précédentes, dans lequel les encoches (20, 22) ont une forme concave de façon générale.
22. Support selon l'une quelconque des revendications précédentes, dans lequel les encoches comportent une surface inclinée vers le haut depuis sa périphé-

rie vers la fente (18) du fil de liaison et dans au moins une partie des ailettes de tirage, et une portée de support proche de la fente (18).

23. Support selon l'une quelconque des revendications précédentes, dans lequel les encoches divisent les bouts de chacune des ailettes de tirage en un bout médial et un bout distal, et l'un des bouts médial et distal a une longueur occlusale-gingivale supérieure à celle de l'autre des bouts médial et distal.

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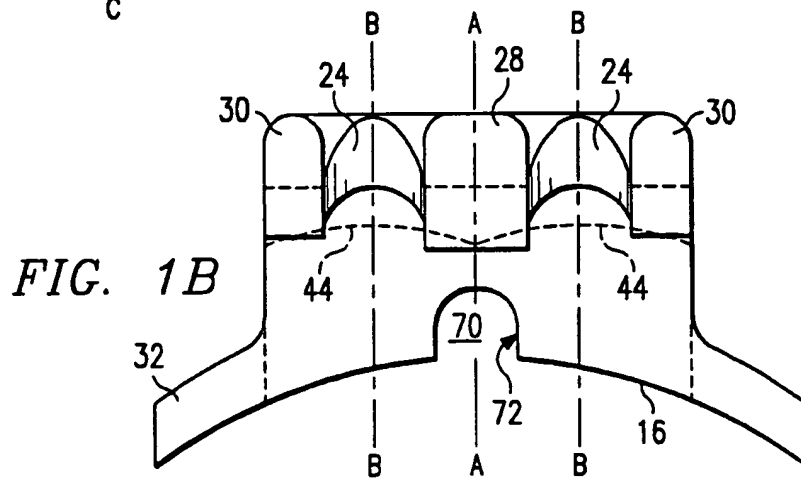
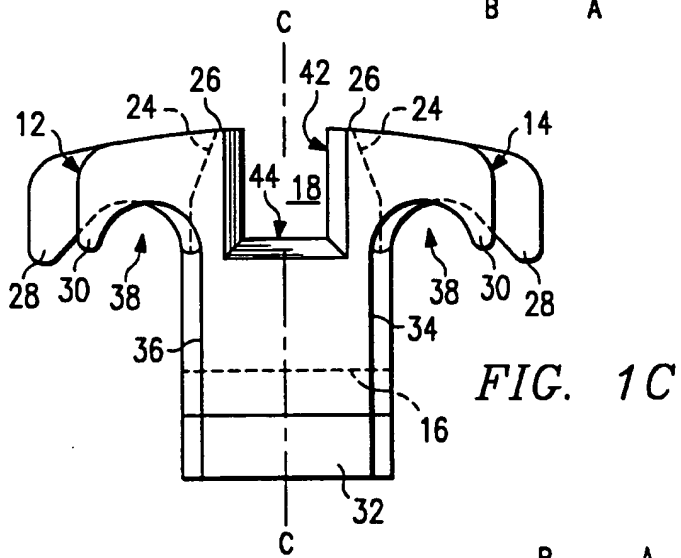
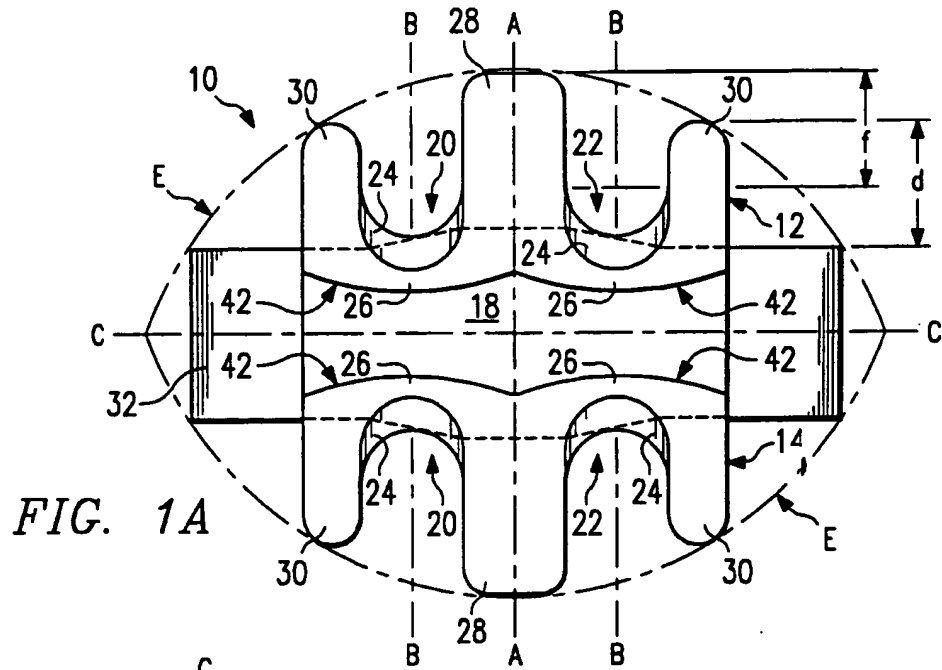
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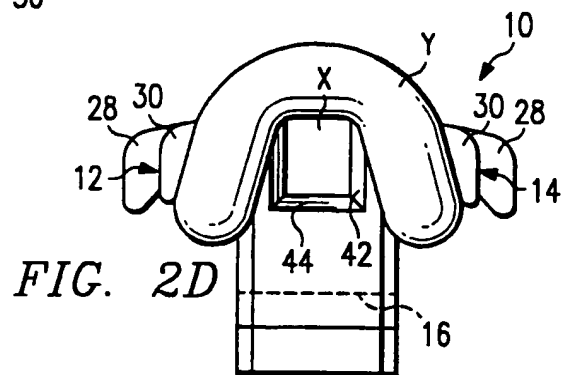
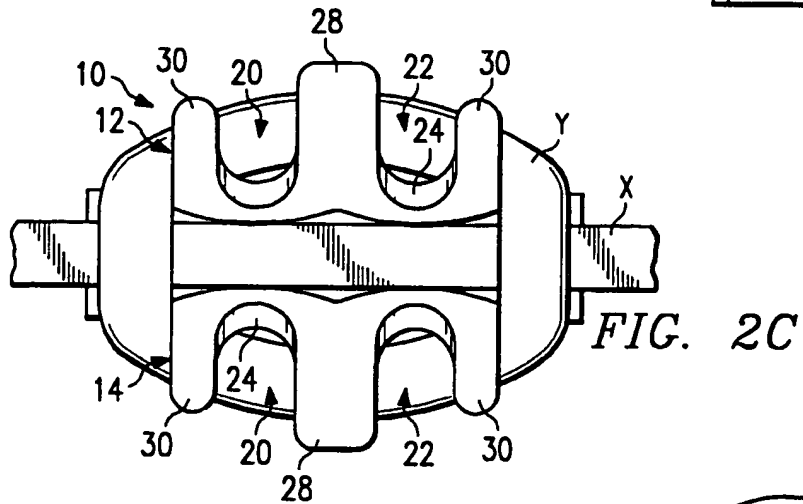
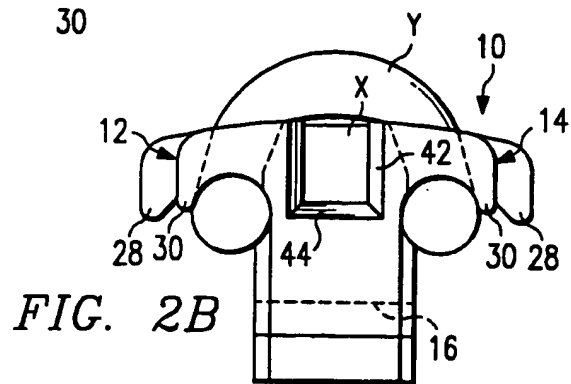
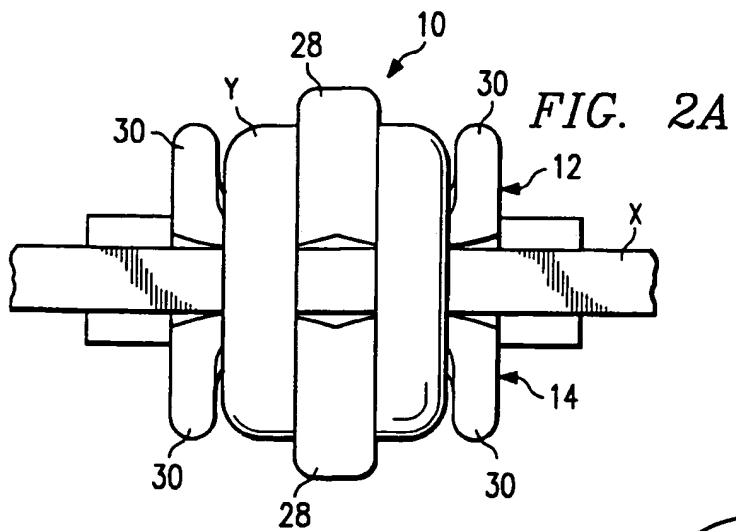
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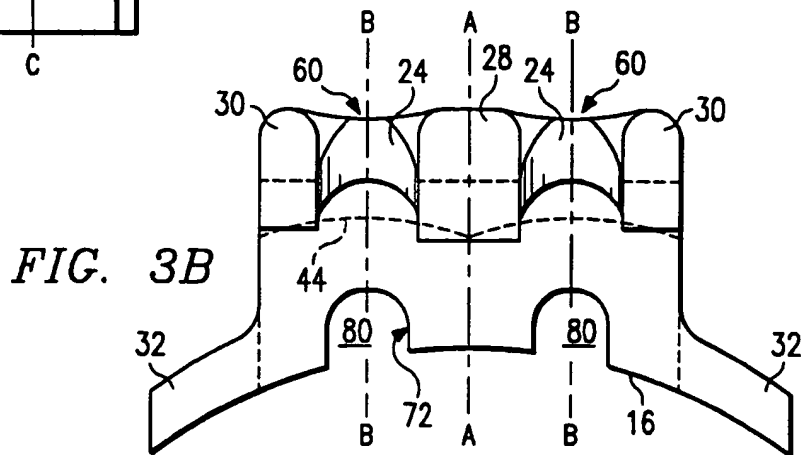
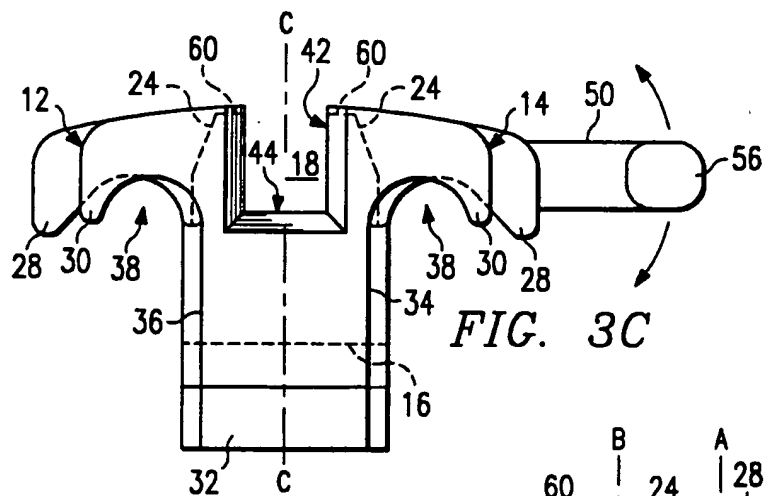
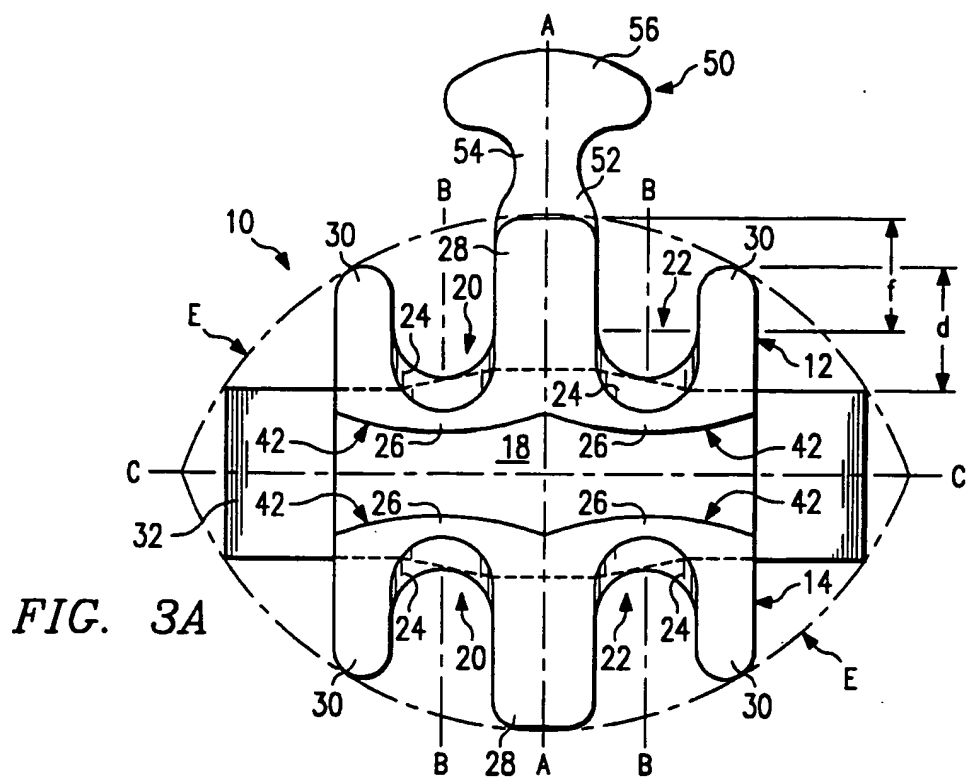




FIG. 4A

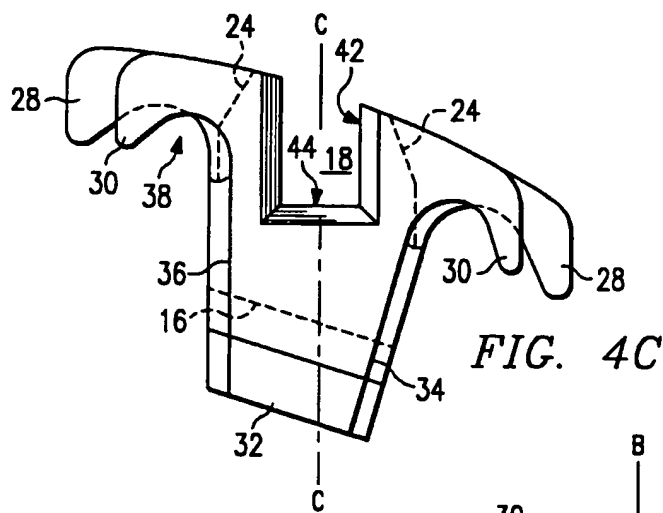
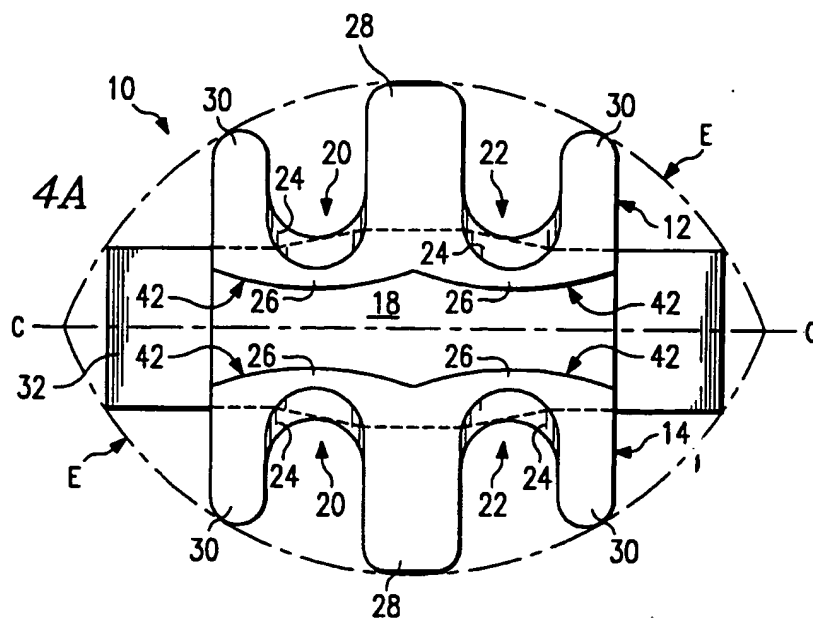


FIG. 4B

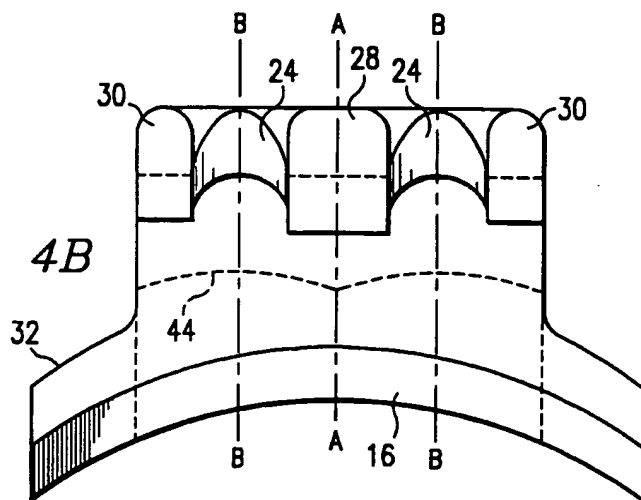


FIG. 5A

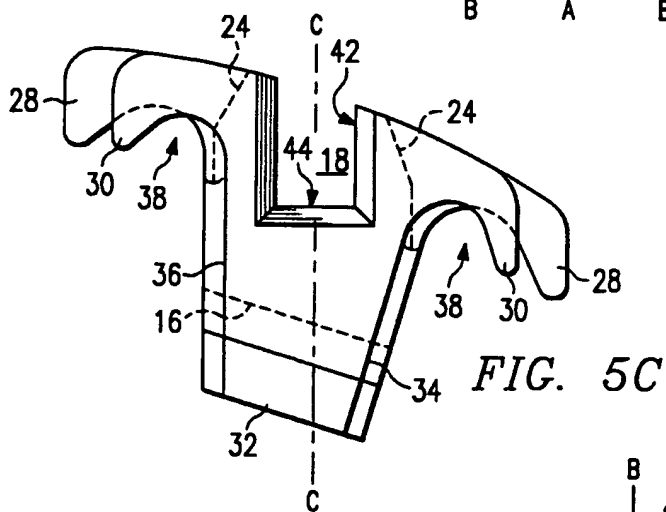
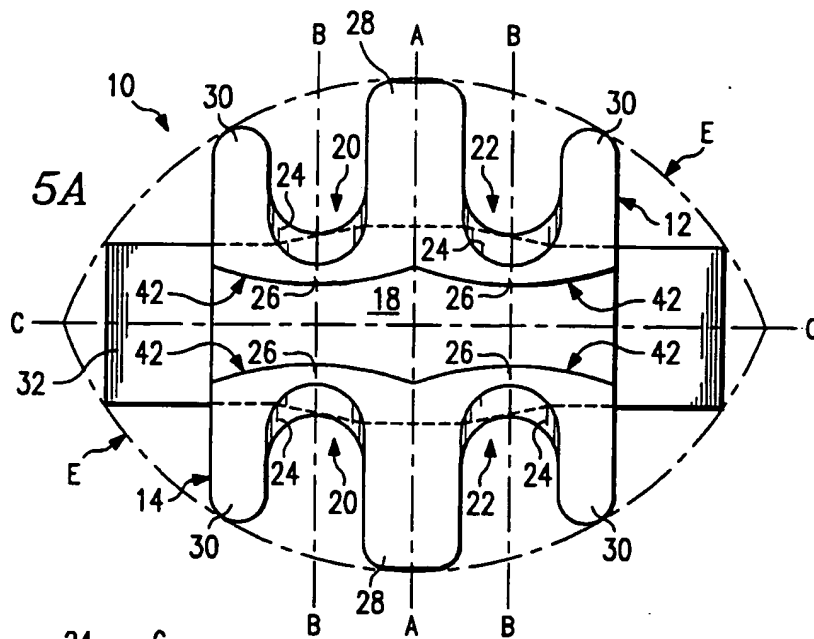
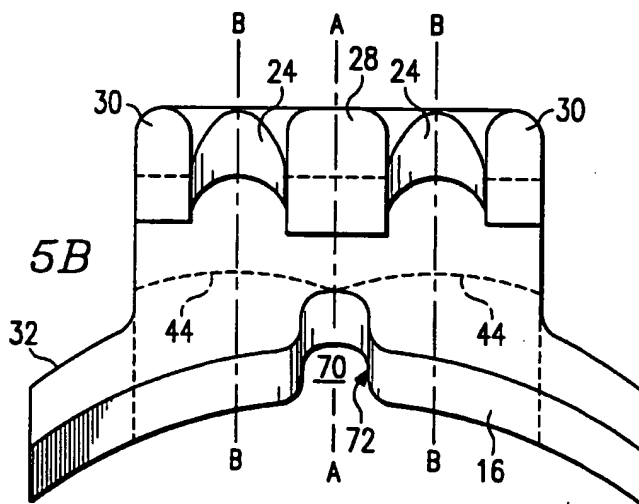
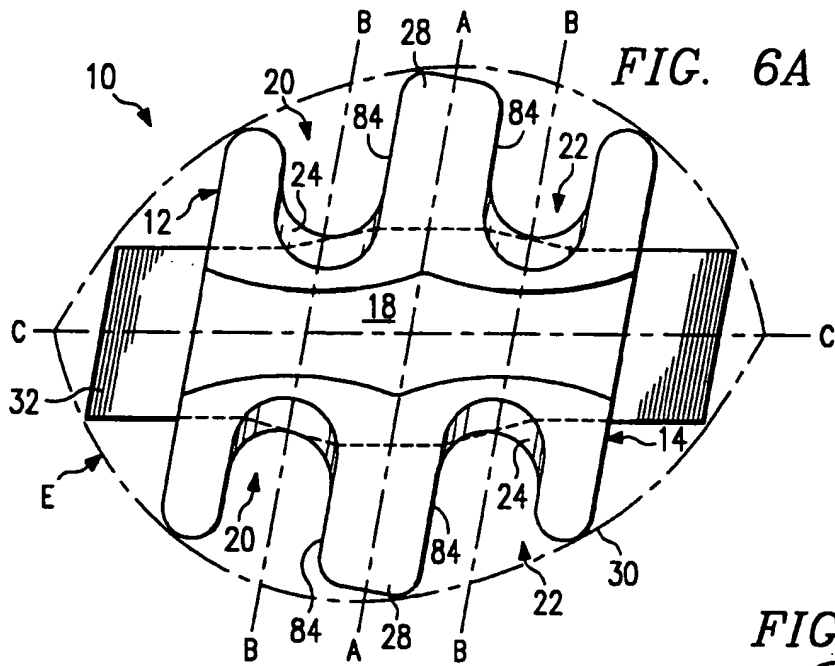


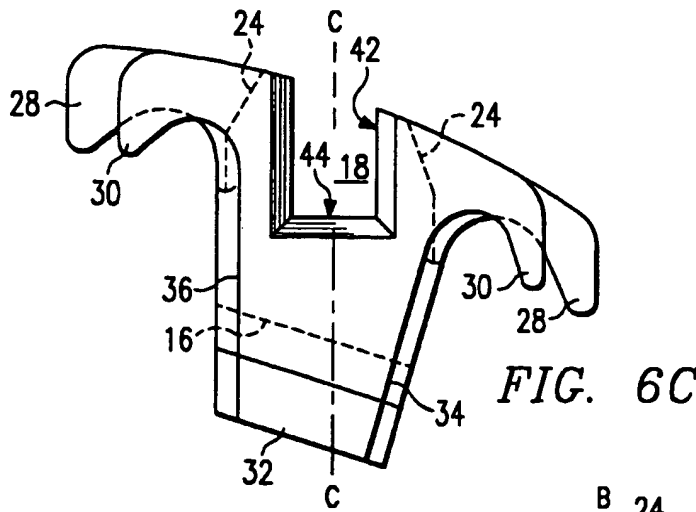
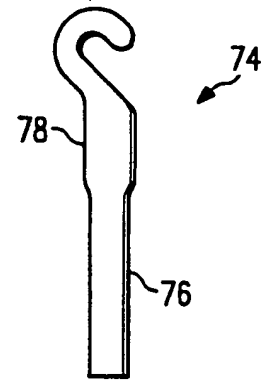
FIG. 5C

FIG. 5B





**FIG. 7A**



**FIG. 7B**

